REMARKS

By this Amendment, claims 1-6 and 8-26 are amended, and claims 27-31 are added. Claim 7 remains in the application. Thus, claims 1-31 are active in the application. Reexamination and reconsideration of the application are respectfully requested.

The specification and abstract have been carefully reviewed and revised in order to correct grammatical and idiomatic errors in order to aid the Examiner in further consideration of the application. The amendments to the specification and abstract are incorporated in the attached substitute specification and abstract. No new matter has been added.

Also attached hereto is a marked-up version of the substitute specification and abstract illustrating the changes made to the original specification and abstract.

In item 2 on page 1 of the Office Action, the title of the invention was objected to as not being descriptive. The Examiner therefore required a new title of the invention which is clearly indicative of the invention to which the claims are directed. In response to this requirement, the Applicants revised the title of the invention to "Real-Time OS Simulator and Method For Running On a Multi-Thread OS and Simulating Threads of the Multi-Thread OS." The Applicants respectfully submit that the new title of the invention is clearly indicative of the invention to which the claims of the present invention are directed. Therefore, the Applicants respectfully request the Examiner to approve the new title of the invention and to withdraw the objection to the title of the invention as not being descriptive.

The Applicants note that the Examiner failed to consider the reference listed on the April 19, 2001 Form PTO-1449. As indicated in item 4 on the April 19, 2001, a concise explanation of reference "AJ" listed on the April 19, 2001 Form PTO-1449 was provided in page 3 of the original specification, and an English language abstract of reference "AJ" was provided with the April 19, 2001 Information Disclosure Statement. Accordingly, the Applicants respectfully submit that a concise statement of the relevance of reference "AJ" was provided by the Applicants. Therefore, the Applicants respectfully request the Examiner to consider reference "AJ" and to return an Examiner-initialed copy

of the April 19, 2001 Form PTO-1449 to indicate consideration of the reference listed thereon.

In item 4 on page 1 of the Office Action, claims 1-25 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the Applicants regard as the invention. The Applicants respectfully submit that claims 1-31 have been drafted in such a way so as to overcome the rejection of claims 1-25 under 35 U.S.C. § 112, second paragraph.

In particular, claim 1 has been amended in order to more clearly recite that the real-time OS simulator runs on a general-purpose multi-thread OS. Further, claim 1 has also been amended in order to more clearly recite that the real-time OS simulator assigns a plurality of threads of the general-purpose multi-thread OS to a plurality of tasks of a real-time OS to be simulated. Claim 1 has been further amended to more clearly recite that the task switching thread receives from the system function the instruction to switch a state of the currently running task of the simulated real-time OS by resuming a plurality of threads of the general-purpose multi-thread OS corresponding to task processing threads according to the capabilities of the general-purpose multi-thread OS. Similar clarifying amendments were made to claims 14 and 20 to more clearly recite the inventions of claims 14 and 20.

Accordingly, the Applicants respectfully submit that claims 1-31 are clearly definite by particularly pointing out and distinctly claiming the subject matter which the Applicants regard as the invention. Therefore, the Applicants respectfully request the Examiner to withdraw the rejection of claims 1-25 under 35 U.S.C. § 112, second paragraph.

In item 6 on page 2 of the Office Action, claims 1, 6-7, 10-14, 17, 19-20 and 25 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Borkenhagen et al. (U.S. 6,567,839) in view of the Applicants' admitted prior art (hereinafter "the AAPA") as disclosed in the Description of the Background Art on pages 1-5 of the original and substitute specifications.

The present invention provides a real-time OS simulator and a simulation method which run on a general-purpose multi-thread OS. The real-time OS simulator and the simulation method assign a plurality of threads of the general-purpose multi-thread OS to

a plurality of tasks of a real-time OS to be simulated, and simulate an operation of the real-time OS on the general-purpose multi-thread OS. The simulator and the simulation method set a number of threads of the general-purpose multi-thread OS as task processing threads, and set another thread of the general-purpose multi-thread OS as a task switching thread. The task processing threads communicate with the task switching thread via system functions to effect task switching. Task switching is simulated by a thread corresponding to a task processing thread which sets the next task processing thread to be run, and which arranges to have itself suspended by appropriately instructing the task switching thread.

Claim 1 of the present invention recites a real-time simulator which runs on a general-purpose multi-thread OS. The simulator of claim 1 is operable to respectively assign a plurality of threads of the general-purpose multi-thread OS to a plurality of tasks of a real-time OS to be simulated, and to simulate an operation of the real-time OS on the general-purpose multi-thread OS.

The simulator of claim 1 comprises a system function, called by one of the plurality of threads of the general-purpose multi-thread OS which is assigned as a first task processing thread, operable to communicate with another of the plurality of threads of the general-purpose multi-thread OS for providing an instruction thereto so as to switch a state of the currently running task of the simulated real-time OS from that of the first task processing thread to that of a thread of the general-purpose multi-thread OS which is assigned as a second task processing thread. The simulator of claim 1 also comprises a task switching thread operable to receive from the system function the instruction to switch a state of the currently running task of the simulated real-time OS by resuming a plurality of threads of the general-purpose multi-thread OS corresponding to task processing threads according to the capabilities of the general-purpose multi-thread OS.

Claims 14 and 20 each recite a simulation method of assigning threads of a general-purpose multi-thread OS to task processing threads of a real-time OS to be simulated, and simulating an operation of the real-time OS on the general-purpose multi-thread OS.

The simulation method of claims 14 and 20 each comprise receiving a request issued from a thread of the general-purpose multi-thread OS which is assigned as a task processing thread, and providing an instruction to another thread of the general-purpose multi-thread OS which is assigned as task switching thread for switching the tasks in response to the request received in the receiving of the request. The simulation method of claims 14 and 20 also each comprise making a selected thread of the general-purpose multi-thread OS which is assigned as a task processing thread run by resuming the selected task processing thread according to the capabilities of the general-purpose multi-thread OS.

Borkenhagen et al. discloses a system and method for performing computer processing operations in a data processing system which includes a multi-threaded processor and thread switch logic. The system and method of Borkenhagen et al., however, are clearly disclosed as concerning the functioning of a CPU and how the CPU performs hardware multi-threading. In particular, Borkenhagen et al. discloses in Column 3, lines 63-67, that the "thread" as used in hardware systems is different from the use of the term "thread" in software systems.

The CPU of Borkenhagen et al. includes a thread switch logic which contains various registers that determine which thread will be the active or the executing thread (see Column 11, lines 21-25). Borkenhagen et al. also discloses that that the thread switch logic receives a number of events, and based on the received events, the thread switch logic determines which thread should be switched and under what circumstances (see Column 12, line 58 to Column 13, line 21).

Accordingly, Borkenhagen et al. clearly discloses an actual hardware system of a CPU which is capable of improving the efficiency of the CPU by employing hardware multi-threading of tasks which are to be performed by the CPU. Therefore, as acknowledged by the Examiner, Borkenhagen et al. does not disclose or suggest a system or method which is a real-time OS simulator. However, the Examiner asserted that the AAPA discloses a real-time OS simulator, and therefore concluded that it would have been obvious to combine Borkenhagen et al. and the AAPA because "the AAPA's real-time OS simulator would increase the efficiency and reliability of Borkenhagen's system by [simulating] the process during software development."

Despite the Examiner's stated motivation to combine Borkenhagen et al. and the AAPA, the Applicants respectfully submit that it would not have been sensible for one of ordinary skill in the art to combine and motivate Borkenhagen et al. and the AAPA since Borkenhagen et al. does not involve software development whatsoever and is merely concerned with the hardware design of a CPU. Furthermore, the Applicants respectfully submit that one skilled in the art would not have understood how a simulator for simulating an operating system, which is disclosed in the AAPA, can be used and modified to simulate the hardware design of a CPU.

Nonetheless, despite the fact that Borkenhagen et al. does not disclose or suggest a real-time simulator, the hardware system of Borkenhagen et al. for multi-threading tasks is clearly not disclosed or suggested as comprising a system function, called by one of the plurality of threads of the general-purpose multi-thread OS which is assigned as a first task processing thread, operable to communicate with another of the plurality of threads of the general-purpose multi-thread OS for providing an instruction thereto so as to switch a state of the currently running task of the simulated real-time OS from that of the first task processing thread to that of a thread of the general-purpose multi-thread OS which is assigned as a second task processing thread, as recited in claim 1. Furthermore, the system and method of Borkenhagen et al. are clearly not disclosed or suggested as comprising a task switching thread operable to receive from the system function the instruction to switch a state of the currently running task of the simulated real-time OS by resuming a plurality of threads of the general-purpose multi-thread OS corresponding to task processing threads according to the capabilities of the general-purpose multi-thread OS, as recited in claim 1.

Furthermore, the system and method of Borkenhagen et al. are not disclosed or suggested as receiving a request issued from a thread of the general-purpose multi-thread OS which is assigned as a task processing thread, and providing an instruction to another thread of the general-purpose multi-thread OS which is assigned as task switching thread for switching the tasks in response to the request received in the receiving of the request, as recited in claims 14 and 20. Moreover, Borkenhagen et al. does not disclose or suggest making a selected thread of the general-purpose multi-thread OS which is assigned as a task processing thread run by resuming the selected task processing thread

according to the capabilities of the general-purpose multi-thread OS, as recited in claims 14 and 20.

The AAPA discloses a simulator for simulating an operating system. The simulator of the AAPA is a piece of software running on a general-purpose operating system. The simulator of the AAPA comprises three threads corresponding to tasks which would normally be running on the simulated operating system, and a scheduler thread which regularly interrupts the three threads so as to dynamically switch among the threads to run.

However, the AAPA clearly does not disclose a system function which is called by a task processing thread that communicates with a task switching thread to effect task switching. Rather, as described in lines 4-11 on page 4 of the original specification (lines 5-11 on page 4 of the substitute specification), the scheduler thread of the AAPA performs preemptive control by dynamically switching among the threads to run and is therefore unable to perform non-preemptive task control where a running task is switched when the task calls the real-time OS.

Accordingly, similar to Borkenhagen et al., the AAPA also fails to disclose or suggest a real-time simulator which comprises a system function, called by one of the plurality of threads of the general-purpose multi-thread OS which is assigned as a first task processing thread, operable to communicate with another of the plurality of threads of the general-purpose multi-thread OS for providing an instruction thereto so as to switch a state of the currently running task of the simulated real-time OS from that of the first task processing thread to that of a thread of the general-purpose multi-thread OS which is assigned as a second task processing thread, as recited in claim 1. Furthermore, similar to Borkenhagen et al., the AAPA also fails to disclose or suggest a real-time simulator which comprises a task switching thread operable to receive from the system function the instruction to switch a state of the currently running task of the simulated real-time OS by resuming a plurality of threads of the general-purpose multi-thread OS corresponding to task processing threads according to the capabilities of the general-purpose multi-thread OS, as recited in claim 1.

Moreover, similar to Borkenhagen et al., the AAPA also fails to disclose or suggest a simulation method which comprises receiving a request issued from a thread of

the general-purpose multi-thread OS which is assigned as a task processing thread, and providing an instruction to another thread of the general-purpose multi-thread OS which is assigned as task switching thread for switching the tasks in response to the request received in the receiving of the request, as recited in claims 14 and 20. Furthermore, similar to Borkenhagen et al., the AAPA also fails to disclose or suggest a simulation method which comprises making a selected thread of the general-purpose multi-thread OS which is assigned as a task processing thread run by resuming the selected task processing thread according to the capabilities of the general-purpose multi-thread OS, as recited in claims 14 and 20.

Accordingly, neither Borkenhagen et al. nor the AAPA, either individually or in combination, disclose or suggest each and every limitation of claims 1, 14 and 20. Therefore, no obvious combination of Borkenhagen et al. and the AAPA would result in the inventions of claims 1, 14 and 20 since Borkenhagen et al. and the AAPA clearly fail to disclose or suggest, either individually or in combination, each and every limitation of claims 1, 14 and 20.

Therefore, the Applicants respectfully submit that claims 1, 14 and 20 are clearly patentable over Borkenhagen et al. and the AAPA.

In item 14 on page 5 of the Office Action, claims 2-3, 5, 15 and 21 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Borkenhagen et al. in view of the AAPA and further in view of Milot et al. (U.S. 6,437,788). In item 19 on page 6 of the Office Action, claims 4, 16 and 22-23 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Borkenhagen et al. in view of the AAPA and further in view of Hutchinson et al. (U.S. 6,026,428). Further, in item 23 on page 7 of the Office Action, claims 8-9, 18 and 24 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Borkenhagen et al. in view of the AAPA and further in view of Shi et al. (6,757,897).

As described above, neither Borkenhagen et al. nor the AAPA, either individually or in combination, disclose or suggest each and every limitation of claims 1, 14 and 20. Moreover, the Applicants respectfully submit that Milot et al., Hutchinson et al. and Shi et al. also clearly fail to disclose or suggest each and every limitation recited in claims 1, 14 and 20. Therefore, Milot et al., Hutchinson et al. and Shi et al. clearly do not cure the

deficiencies of Borkenhagen et al. and the AAPA for failing to disclose each and every limitation of claims 1, 14 and 20.

Accordingly, no obvious combination of Borkenhagen et al., the AAPA, Milot et al., Hutchinson et al. and Shi et al. would result in the inventions of claims 1, 14 and 20 since Borkenhagen et al., the AAPA, Milot et al., Hutchinson et al. and Shi et al. fail to disclose or suggest, either individually or in combination, each and every limitation of claims 1, 14 and 20.

Therefore, the Applicants respectfully submit that claims 1, 14 and 20 are clearly patentable over Borkenhagen et al., the AAPA, Milot et al., Hutchinson et al. and Shi et al.

The Applicants note that the Examiner failed to examine claim 26, which was added in the April 19, 2001 Preliminary Amendment. However, for the reasons given above, Borkenhagen et al., the AAPA, Milot et al., Hutchinson et al. and Shi et al. fail to disclose or suggest, either individually or in combination, each and every limitation recited in claim 1. Therefore, the Applicants respectfully submit that claim 26, which indirectly depends from claim 1, is also not disclosed or suggested by Borkenhagen et al., the AAPA, Milot et al., Hutchinson et al. and Shi et al.

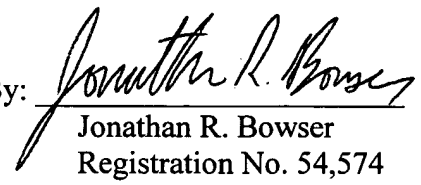
Because of the clear distinctions discussed above, it is submitted that the teachings of Borkenhagen et al., the AAPA, Milot et al., Hutchinson et al. and Shi et al. clearly do not meet each and every limitation of claims 1, 14 and 20. Furthermore, it is submitted that the distinctions are such that a person having ordinary skill in the art at the time the invention was made would not have been motivated to modify Borkenhagen et al., the AAPA, Milot et al., Hutchinson et al. and Shi et al. in such as manner as to result in, or otherwise render obvious, the present invention as recited in claims 1, 14 and 20. Therefore, it is submitted that the claims 1, 14 and 20, as well as claims 2-13, 15-19 and 21-31 which depend therefrom, are clearly allowable over the prior art as applied by the Examiner.

In view of the foregoing amendments and remarks, it is respectfully submitted that the present application is clearly in condition for allowance. An early notice thereof is respectfully solicited.

If, after reviewing this Amendment, the Examiner feels there are any issues remaining which must be resolved before the application can be passed to issue, the Examiner is respectfully requested to contact the undersigned by telephone in order to resolve such issues.

Respectfully submitted,

Shinichiro ETO et al.

By: 

Jonathan R. Bowser
Registration No. 54,574
Attorney for Applicants

JRB/ck
Washington, D.C. 20006-1021
Telephone (202) 721-8200
Facsimile (202) 721-8250
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